Ocular Photoscreening

Policy Number: 2026T0660F
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➲ Instructions for Use

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Related Commercial/Individual Exchange Policy

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Application

UnitedHealthcare Commercial

This Medical Policy applies to UnitedHealthcare Commercial benefit plans.

UnitedHealthcare Individual Exchange

This Medical Policy applies to Individual Exchange benefit plans.

Coverage Rationale

➲ See Benefit Considerations

Instrument-based ocular photoscreening is proven and medically necessary for the following:

- As a mass screening instrument for children 1 to 5 years of age (ends on sixth birthday); or
- In individuals 6 years of age or older who have a developmental delay and are unable or unwilling to cooperate with routine visual acuity screening

Instrument-based ocular photoscreening is unproven and not medically necessary for all other individuals, including children less than 1 year of age, due to insufficient evidence of safety and/or efficacy.

Retinal birefringence scanning/retinal polarization scanning is unproven and not medically necessary for the detection of eye misalignment or strabismus due to insufficient evidence of safety and/or efficacy.

Applicable Codes

The following list(s) of procedure and/or diagnosis codes is provided for reference purposes only and may not be all inclusive. Listing of a code in this policy does not imply that the service described by the code is a covered or non-covered health service. Benefit coverage for health services is determined by the member specific benefit plan document and applicable laws that may require coverage for a specific service. The inclusion of a code does not imply any right to reimbursement or guarantee claim payment. Other policies and guidelines may apply.

CPT Code	Description
0469T	Retinal polarization scan, ocular screening with on-site automated results, bilateral

CPT Code	Description
99174	Instrument-based ocular screening (e.g., photo screening, automated-refraction), bilateral; with remote analysis and report
99177	Instrument-based ocular screening (e.g., photo screening, automated-refraction), bilateral; with on-site analysis

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Diagnosis Code	Description
For development delay, or those unable or unwilling to cooperate with routine visual acuity screening	
F70	Mild intellectual disabilities
F71	Moderate intellectual disabilities
F72	Severe intellectual disabilities
F73	Profound intellectual disabilities
F78.A1	SYNGAP1-related intellectual disability
F78.A9	Other genetic related intellectual disability
F79	Unspecified intellectual disabilities
F80.0	Phonological disorder
F80.1	Expressive language disorder
F80.2	Mixed receptive-expressive language disorder
F80.4	Speech and language development delay due to hearing loss
F80.81	Childhood onset fluency disorder
F80.82	Social pragmatic communication disorder
F80.89	Other developmental disorders of speech and language
F80.9	Developmental disorder of speech and language, unspecified
F81.0	Specific reading disorder
F81.2	Mathematics disorder
F81.81	Disorder of written expression
F81.89	Other developmental disorders of scholastic skills
F81.9	Developmental disorder of scholastic skills, unspecified
F82	Specific developmental disorder of motor function
F84.2	Rett's syndrome
F84.0	Autistic disorder
F84.3	Other childhood disintegrative disorder
F84.5	Asperger's syndrome
F84.8	Other pervasive developmental disorders
F84.9	Pervasive developmental disorder, unspecified
F88	Other disorders of psychological development
F89	Unspecified disorder of psychological development
F90.0	Attention-deficit hyperactivity disorder, predominantly inattentive type
F90.1	Attention-deficit hyperactivity disorder, predominantly hyperactive type
F90.2	Attention-deficit hyperactivity disorder, combined type
F90.8	Attention-deficit hyperactivity disorder, other type
F90.9	Attention-deficit hyperactivity disorder, unspecified type
G80.0	Spastic quadriplegic cerebral palsy
G80.1	Spastic diplegic cerebral palsy
G80.2	Spastic hemiplegic cerebral palsy
G80.3	Athetoid cerebral palsy

Diagnosis Code	Description
For development delay, or those unable or unwilling to cooperate with routine visual acuity screening	
G80.4	Ataxic cerebral palsy
G80.8	Other cerebral palsy
G80.9	Cerebral palsy, unspecified
H93.25	Central auditory processing disorder
Q05.0	Cervical spina bifida with hydrocephalus
Q05.1	Thoracic spina bifida with hydrocephalus
Q05.2	Lumbar spina bifida with hydrocephalus
Q05.3	Sacral spina bifida with hydrocephalus
Q05.4	Unspecified spina bifida with hydrocephalus
Q05.5	Cervical spina bifida without hydrocephalus
Q05.6	Thoracic spina bifida without hydrocephalus
Q05.7	Lumbar spina bifida without hydrocephalus
Q05.8	Sacral spina bifida without hydrocephalus
Q05.9	Spina bifida, unspecified
Q07.00	Arnold-Chiari syndrome without spina bifida or hydrocephalus
Q07.01	Arnold-Chiari syndrome with spina bifida
Q07.02	Arnold-Chiari syndrome with hydrocephalus
Q07.03	Arnold-Chiari syndrome with spina bifida and hydrocephalus
Q90.0	Trisomy 21, non - mosaicism (meiotic nondisjunction)
Q90.1	Trisomy 21, mosaicism (mitotic nondisjunction)
Q90.2	Trisomy 21, translocation
Q90.9	Down syndrome, unspecified
Q91.0	Trisomy 18, non - mosaicism (meiotic nondisjunction)
Q91.1	Trisomy 18, mosaicism (mitotic nondisjunction)
Q91.2	Trisomy 18, translocation
Q91.3	Trisomy 18, unspecified
Q91.4	Trisomy 13, non - mosaicism (meiotic nondisjunction)
Q91.5	Trisomy 13, mosaicism (mitotic nondisjunction)
Q91.6	Trisomy 13, translocation
Q91.7	Trisomy 13, unspecified
Q92.0	Whole chromosome trisomy, non - mosaicism (meiotic nondisjunction)
Q92.1	Whole chromosome trisomy, mosaicism (mitotic nondisjunction)
Q92.2	Partial trisomy
Q92.5	Duplications with other complex rearrangements
Q92.7	Triploidy and polyploidy
Q92.8	Other specified trisomies and partial trisomies of autosomes
Q92.9	Trisomy and partial trisomy of autosomes, unspecified
Q93.0	Whole chromosome monosomy, non - mosaicism (meiotic nondisjunction)
Q93.1	Whole chromosome monosomy, mosaicism (mitotic nondisjunction)
Q93.2	Chromosome replaced with ring, dicentric or isochromosome
Q93.3	Deletion of short arm of chromosome 4
Q93.4	Deletion of short arm of chromosome 5
Q93.51	Angelman syndrome
Q93.59	Other deletions of part of a chromosome

Diagnosis Code	Description
For development delay, or those unable or unwilling to cooperate with routine visual acuity screening	
Q93.7	Deletions with other complex rearrangements
Q93.81	Velo-cardio-facial syndrome
Q93.82	Williams Syndrome
Q93.88	Other microdeletions
Q93.89	Other deletions from the autosomes
Q93.9	Deletion from autosomes, unspecified
Q95.2	Balanced autosomal rearrangement in abnormal individual
Q95.3	Balanced sex/autosomal rearrangement in abnormal individual
Q95.5	Individual with autosomal fragile site
Q95.8	Other balanced rearrangements and structural markers
Q95.9	Balanced rearrangement and structural marker, unspecified
Q96.0	Karyotype 45, X
Q96.1	Karyotype 46, X iso (Xq)
Q96.2	Karyotype 46, X with abnormal sex chromosome, except iso (Xq)
Q96.3	Mosaicism, 45, X/46, XX or XY
Q96.4	Mosaicism, 45, X/other cell line(s) with abnormal sex chromosome
Q96.8	Other variants of Turner's syndrome
Q96.9	Turner's syndrome, unspecified
Q98.0	Klinefelter syndrome karyotype 47, XXY
Q98.1	Klinefelter syndrome, male with more than two X chromosomes
Q98.3	Other male with 46, XX karyotype
Q98.4	Klinefelter syndrome, unspecified
Q99.2	Fragile X chromosome
R41.840	Attention and concentration deficit
R62.0	Delayed milestone in childhood
Z91.198	Patient's noncompliance with other medical treatment and regimen for other reason
Z91.199	Patient's noncompliance with other medical treatment and regimen due to unspecified reason
Z91.A98	Caregiver's noncompliance with patient's other medical treatment and regimen for other reason

Description of Services

Ocular photoscreening is a method for detection of visual impairments that involves collection and analysis of images of the eyes that are captured with a digital or film camera. This technique is being used for the detection of visual disorders that can predispose children to amblyopia, in which the brain inactivates an eye that has a significant visual impairment. Early diagnosis and treatment of these conditions have been shown to yield better visual outcomes. Ocular photoscreening is based on the principle of photorefraction, in which the refractive state of the eye is assessed via the pattern of light reflected through the pupil. The images can then be analyzed based on the position of the corneal light reflex as well as the overall reflection of light from the fundus, which provides information on the child's fixation pattern and the presence or absence of strabismus. Individuals are photographed in a darkened room while looking at the camera. The photographs can be sent to a central laboratory for analysis, either by ophthalmologists or specifically trained personnel. Results are typically graded as pass, fail, or repeat photoscreening.

Retinal polarization scanning, also known as retinal birefringence scanning, is a method for detecting the central fixation of the eye. Retinal birefringence scanning can be used in pediatric ophthalmology screening. By simultaneously measuring the central fixation of both eyes, small- and large-angle strabismus can be detected. The method is noninvasive and requires little cooperation by the individual, allowing it to be used for detecting strabismus in young children. The method is aimed at trying to provide a reliable detection of strabismus and has also been used for detecting certain kinds of amblyopia.

Benefit Considerations

Most UnitedHealthcare Commercial and Individual Exchange plans cover instrument-based screenings (CPT codes 99174 and 99177) as a preventive care services benefit in certain circumstances. Refer to the Medical Policy titled Preventive Care Services and to the member specific benefit plan document for further details about the preventive care services benefit.

Clinical Evidence

Photoscreening

Ocular photoscreening has been investigated as an alternative screening method to detect risk factors for amblyopia, strabismus, high refractive errors, anisometropia, and media opacities.

Oatts et al. (2025) performed a systematic review and meta-analysis on existing research on how accurately instrument-based screening devices detect amblyopia risk factors (ARFs). Of 291 article results, 41 articles were reviewed fully, and 33 met the inclusion criteria. All 33 studies received a level III evidence rating. Nine types of screening devices appeared in these studies, with Plusoptix, Spot®, and Retinomax being the most frequently used. Most individuals were children aged 6 years or younger, and the majority of studies took place in ophthalmology clinics, followed by school and community settings. The sensitivity for detecting ARFs ranged from 32.3% to 100%, and the specificity ranged from 38.7% to 94%. Plusoptix sensitivity ranged from 32.3% to 100%, and the specificity ranged from 38.7% to 100%. Retinomax showed a sensitivity of 70% to 95% and a specificity of 58% to 94%; Spot had a sensitivity of 60% to 94% and a specificity of 67% to 97%. Failure thresholds differed across studies, but since 2013, most have followed American Association for Pediatric Ophthalmology and Strabismus (AAPOS) guidelines. In 21 studies that reported referral rates (children who did not pass screening), rates varied widely from 2.26% to 63%, with higher rates in clinic-based studies. The authors concluded that the evidence supports using instrument-based screening devices for detecting amblyopia and ARFs, although differences in study design, settings, and the ages screened were significant. Diagnostic accuracy also depended on the device. The authors recommend that future research use standardized reporting measures to improve evidence quality and better inform screening strategies and program decisions. Limitations noted by the authors include the omission of 95% confidence intervals CIs for sensitivity and specificity, missing referral rate data, lack of details on screening time and inconclusive tests, unclear definitions of the gold standard, and non-adherence to uniform guidelines. (Vilà-de Muga et al., 2021, which was previously cited in this policy, is included in this systematic review.)

A systematic review and meta-analysis by Ferreira et al. (2023) was conducted to review the outcomes of photoscreening applied to children under the age of 3 years. A meta-analysis of 13 studies (n = 64,041) was selected to summarize the referral rate, untestable rate, and positive predictive value (PPV) from its inception to March 2021. The study concluded that 13% (95% CI, 7%-19%) of children who were screened were referred for further confirmation of the screening result; the untestable rate was 8% (95% CI, 3%-15%), and the calculated PPV was 56% (95% CI, 40%-71%). The authors concluded that there is no consensus on the most favorable age, frequency, or magnitude of refractive error to be considered an ARF. As a result, clinicians' judgment remains central in managing amblyopia. The authors concluded that this study has limitations, including the heterogeneity of the studies, which was well documented by the wide range of referral rate (3.3%-47.8%), inconclusive rate (0.3%-31%), and PPV (19%-86.4%), as well as the data reported. Five and four studies did not report the inconclusive rate and the PPV, respectively; just five of the 13 studies reported on the prevalence of refractive errors, and only four included data on the proportion of children in whom an intervention was prescribed. Because referral criteria varied, it was not possible to directly compare devices and studies. The PPV depends on how common the condition is and varied across these studies due to differences in referral criteria. While meta-analyses attempt to summarize the PPV, this figure may be more illustrative than truly representative of the screening's overall performance. (Vilà-de Muga et al., 2021, previously cited in this policy, and Longmuir et al., 2013, are included in this systematic review.)

Neena et al. (2022) conducted a prospective study to assess whether photoscreening effectively detects ARF in children with neurodevelopmental disabilities. Overall, 52 children were initially screened using the Welch Allyn® Spot Vision Screener and later evaluated by a pediatric ophthalmologist for a complete ocular evaluation. Photoscreening had a 96.5% sensitivity, 63.61% specificity, 80% PPV, and 92.31% negative predictive value, with an area under the curve of 79.9%. Key parameters included demographics, type of disability, refraction, ocular alignment, media clarity, additional eye conditions, and examination time. ARFs were determined according to the 2013 AAPOS guidelines. All participants were later examined at their school by a pediatric ophthalmologist, with a parent or caregiver present. The evaluation included vision and squint assessment, ocular motility, media clarity, cycloplegic retinoscopy (with homatropine 2% and tropicamide 1%), handheld slitlamp examination, dilated fundus examination, and assessment of any other ocular issues. Intraocular pressure was measured in suspected cases using a tonometer. Participants who did not complete all

examinations or follow-up were excluded. Examination times for Spot vs those for clinical methods were compared. The presence of ARFs was assessed according to the 2013 AAPOS guidelines for both groups. The study identified that the average age was 10.5 years; 73.1% of participants were male. Cerebral palsy was the most frequent diagnosis, and simple myopic astigmatism was the predominant refractive error. The ARFs were present in 73.1% of cases. The authors concluded that photoscreening is a highly sensitive, judiciously specific, and well-organized tool for identifying ARFs in children with neurodevelopmental disabilities. Additionally, photoscreening is a practical, efficient tool that can identify ARFs in children with neurodevelopmental disabilities, with high sensitivity and good specificity. The limitations of the study include a small sample size; challenges with fixation and obtaining consistent measurements; difficulties with intervention; and problems with ensuring regular follow-up.

Shah et al. (2021) conducted a prospective study to assess the Pediatric Vision Scanner (PVS) for the diagnosis of amblyopia and strabismus in the general pediatric population. Overall, 300 children, who were aged 24 to 72 months, were screened using the PVS. They were then given a comprehensive eye examination by a pediatric ophthalmologist who was masked to the PVS results. The authors stated the following: “Based on the gold standard eye examination, 6 children (2%) had amblyopia and/or strabismus. The PVS detected all 6 cases, yielding a sensitivity rate of 100% (95% CI, 54%-100%). The PVS referred 45 additional children (15%) who had normal ophthalmic findings, yielding a specificity rate of 85% (95% CI, 80%-89%). The median acquisition time for the PVS was 28 seconds.” The authors concluded that “PVS detected amblyopia with high sensitivity and would allow children with amblyopia and/or strabismus to be referred to an eye care specialist as early as 2 years old.”

A retrospective study (Stiff et al., 2020) was performed and compared amblyopia rates and treatment outcomes in children who were aged 0 to 2 years and aged 3 to 5 years and who had been referred from a community-based photoscreening program (Iowa KidSight); this program aims to screen children aged 6 months to 6 years. This retrospective review included the medical records of 319 children who did not pass vision photoscreening through Iowa KidSight and were subsequently seen at the University of Iowa for a complete eye examination during a 13-year period. The outcome measures included the number of children who obtained normal vision and the age at which the normal vision was attained. Also measured was the elapsed time from the screening examination to first documentation of normal vision. The authors stated the following: “Of 319 subjects, 67 (21%) were 0-2 years of age and 252 (79%) were at least 3 years of age at screening. Amblyopia was found in 19% of the younger group and 30% of the older group ($p = 0.12$). Follow-up time was similar between groups. At final follow-up, 8% of children in the younger group did not attain normal vision, compared with 40% in the older group (OR = 8.92; 95% CI, 1.65-92.95; $p = 0.009$). Normal vision was attained on average at 35 months of age in the younger group and 69 months in the older group ($p < 0.0001$).” The authors concluded that (1) children who were less than 3 years of age were found to have an equivalent rate of amblyopia compared with the children who were screened and over the age of 3 years and that (2) those screened between the age of 0 to 2 years were more likely to attain normal vision and at a significantly younger age. However, it is unclear how many of them were aged 6 to 11 months.

In a retrospective study, Barugel et al. (2019) sought to compare the sensitivity, specificity, and referral rate of the Spot Vision Screener (Welch Allyn Inc, Skaneateles Falls, NY) with those of the gold standard cycloplegic measurements acquired using the Retinomax. The study included a population of underprivileged children and teenagers who had limited access to medical care; 41 patients were included, of whom 19 were male, with an age range of 48 to 246 months. The sensitivity of the Spot Vision Screener for the detection of refractive errors was 82.35%, and the specificity was 91.67%. The sensitivity of the Spot Vision Screener to detect hyperopia, myopia, astigmatism, and anisometropia was 27.27%, 84.61%, 78.57%, and 66.67%, respectively. Its specificity to detect hyperopia, myopia, astigmatism, and anisometropia was 100%, 98.55%, 89.71%, and 94.29%, respectively. Based on the previously mentioned thresholds, cycloplegic autorefraction found ametropia in 34 eyes across 17 children, resulting in an overall refractive error rate of 41.46%. Among these children, the Spot Vision Screener correctly identified 14 who were above a threshold, giving a sensitivity of 82.35%. Of the 24 children without detected refractive errors by cycloplegia, the device classified 22 as emmetropic, resulting in a specificity of 91.67%. Overall, the authors concluded that the Spot Vision Screener identified ametropia in 16 children, which results in a referral rate of 39.02%. Of these 16, two did not actually have significant refractive error on cycloplegic testing (false positives). Meanwhile, three children with confirmed refractive errors were missed by the device (false negatives). Additionally, among the 14 true positives, one was referred for astigmatism, but the correct diagnosis was anisometropia. In another instance, the device reported bilateral myopic astigmatism, but the accurate finding was bilateral hyperopia without astigmatism. Refractive errors detecting the specificity of the Spot Vision Screener were discovered to be relatively high (< 90%). The authors concluded that the device is limited by its low sensitivity for detecting hyperopia, which is particularly significant in children due to its high prevalence and potential adverse consequences. Global programs using cycloplegic measurements should be considered as an option. Limitations noted by the authors include a small sample size; heterogeneity of the age range; measurement focus, which only included refractive errors; exclusion of high hyperopia; and professional administration, as only ophthalmologists and orthoptists performed the measurements.

Zhang et al. (2019) conducted a systematic review and meta-analysis to evaluate the diagnostic test accuracy of the Spot and Plusoptix photoscreeners in detecting risk factors for amblyopia in children. Overall, 21 studies, involving 5,022 individuals, were analyzed. Comprehensive examinations determined amblyopia or risk factors according to AAPOS guidelines. The study's findings identified that the Spot and Plusoptix photoscreeners showed similar sensitivity (87.7% vs 89.4%; p = 0.38) and specificity (78.0% vs 89.9%; p = 0.90) for detecting ARFs. In preschool children, the sensitivity was 91.7% (Spot) and 90.2% (Plusoptix), with specificity at 82.6% and 93.0%, respectively. The authors concluded that both devices performed well, especially in younger children, with no significant accuracy difference. Limitations include studies that used various device or software versions for both photoscreeners, which may slightly affect ARF detection accuracy. Because of limited information on specific versions, future research should conduct meta-analyses using photoscreeners of the same version.

In a retrospective study, Longmuir et al. (2013) reported their experience with vision screening in children and compared the results of photoscreening in children aged younger than 3 years with those in children of preschool age or older. During the 11 years of the study, 210,695 pediatric photoscreens were performed at 13,750 sites. In the < 3 years age group, the unreadable rate was 13.0%, referral rate was 3.3%, and overall PPV was 86.6%. In the 3- to 6-year-old children, the unreadable rate was 4.1%, referral rate was 4.7%, and overall PPV was 89.4%. However, in the 6- to 11-month age group, the unreadable rate was 25.5%, referral rate was 3.7%, and overall PPV was 82.5%. The authors concluded that no statistically significant difference was found in screening children from 1 to 3 years of age compared with screening children who were > 3 years old. According to the authors, these results confirm that early screening, before amblyopia is more pronounced, can reliably detect amblyogenic risk factors in children younger than 3 years of age, and they recommended initiation of photoscreening in children aged 1 year or older. They also noted that photoscreens require some cooperation, and children who are < 1 year of age have been previously shown to be difficult to screen, with their photoscreens showing a high unreadable rate.

In a cross-sectional study, Longmuir et al. (2010) reported on a cohort of preschool children who were screened by a photoscreening program (using MTI photoscreener) during a 9-year period in a single, statewide vision screening effort. Children who did not pass the photoscreening were referred to local eye care professionals, who performed a comprehensive eye evaluation. During the 9 years of the continuously operating program, 147,809 children underwent photoscreens to detect amblyopic risk factors at 9,746 sites. Because of abnormal photoscreen results, 6,247 children (4.2%) were referred. The overall PPV of the MTI photoscreener was 94.2%. For those children who were < 1 year of age, the unreadable rate was 21.2%, and in those from 1 to 2 years of age, it was 10.9%. The unreadable rate continued to decrease with increasing age, with an overall unreadable rate of 5.0%.

Clinical Practice Guidelines

American Academy of Ophthalmology (AAO)

The AAO *Vision Screening for Infants and Children* (2022) recommends that vision screening should be performed at an early age and at regular intervals throughout childhood. The elements of vision screening vary depending on the age and level of cooperation of the child. Subjective visual acuity testing is preferred to instrument-based screening in children who are able to participate reliably. Instrument-based screening is useful for some young children and those with developmental delays. Instrument-based screening techniques, such as photoscreening and autorefraction, are useful for assessing amblyopia and reduced-vision risk factors in children aged 1 to 5 years, as this is a critical time for visual development. Instrument-based screening can occur in children aged 6 years or older when children cannot participate in optotype-based screening.

American Academy of Ophthalmology (AAO)/American Association for Pediatric Ophthalmology and Strabismus (AAPOS)/American Association of Certified Orthoptists (AACO)

The AAO, AAPOS, and AACO coauthored a policy statement regarding the use of instrument-based screening devices. These devices are available commercially and have had extensive validation, both in field studies as well as in the pediatricians' offices. Screening instruments detect amblyopia, high refractive error, and strabismus, which are the most common conditions producing visual impairment in children. If available, they can be used at any age but have better success after 18 months of age. Instrument-based screening can be repeated at each annual preventive medicine encounter through 5 years of age or until visual acuity can be assessed reliably using optotypes. Using these techniques in children younger than 6 years of age can enhance detection of conditions that may lead to amblyopia and/or strabismus compared with traditional methods of assessment (Donahue and Baker, 2016a, 2016b).

National Center for Children's Vision and Eye Health (NCCVEH)

The NCCVEH recommended practices for vision screening for children aged 36 to < 72 months have provided the following recommendations:

- All children aged 36 months to younger than 72 months should be screened annually (best practice) or at least once (acceptable minimum standard) during the interval between their third and sixth birthdays. Exceptions to this include children with the following: readily observable ocular abnormalities, neurodevelopmental disorders, systemic conditions that have associated ocular abnormalities, first-degree relatives with strabismus or amblyopia, a history of prematurity (< 32 completed weeks), and parents who believe that their child has a vision problem. These children should be referred directly to an ophthalmologist or optometrist for a comprehensive eye examination. Children who have received an eye examination from an eye care professional within the prior 12 months do not need to be screened. A vision screening program based on best-practice standards should be the goal.
- Children who are unable or refuse to complete testing are considered untestable. These children are more likely to have vision problems than testable children and thus should be rescreened either the same day or soon afterward but in no case later than 6 months. Children with cognitive, physical, or behavioral issues likely to preclude rescreening and those unable to be rescreened in a timely manner because of administrative or other issues should be referred directly for a comprehensive eye examination.
- Currently, there are two best-practice vision screening methods for children aged 36 months to younger than 72 months: (1) monocular vision acuity testing and (2) instrument-based testing using autorefraction.
    - For visual acuity testing, appropriately scaled (logarithm of the minimum angle of resolution) single crowded HOTV letters or LEA symbols, surrounded by crowding bars at a 5-ft (1.5-m) test distance with the child matching or reading the optotypes aloud, should be used. A passing score is the correct identification of three of three or three of four optotypes, with each eye at the 20/50 level for children aged 36 months through 47 months and at the 20/40 level for children aged 48 months to younger than 72 months. Acceptable practices are to use the HOTV or LEA symbols calibrated for a 10-ft (3-m) test distance or to use a single line of these optotypes surrounded by a rectangular crowding bar on all four sides. Other optotypes, like Allen pictures and the Tumbling E, should not be used.
    - The other best-practice vision screening method is instrument-based screening using either the Retinomax autorefractor or the Suresight Vision Screener set in child mode and programmed with the VIP Study pass/fail criteria software for 90% specificity (version 2.24 or 2.25) in minus cylinder form. Using the Plusoptix photoscreener is considered acceptable practice, as is adding the PASS (Preschool Assessment of Stereopsis With a Smile) stereoacuity test as a supplement to one of the best-practice screening methods.
- Vision screening requires training and certification of screening personnel while acquiring sufficient and appropriate space; obtaining and maintaining equipment and supplies; and recording and reporting the screening results to the family, primary care provider/medical home, and, when indicated, the school or appropriate state agency.
- A best practice for children who do not pass vision screening includes documentation of the referral to and subsequent comprehensive eye examination by an optometrist or ophthalmologist (Cotter et al., 2015).

U.S. Preventive Services Task Force (USPSTF)

The USPSTF (USPSTF, 2017) concludes, with moderate certainty, that vision screening to detect amblyopia or its risk factors in children aged 3 to 5 years has a moderate net benefit. They also conclude that the benefits of vision screening to detect amblyopia or its risk factors in children younger than 3 years of age are uncertain and that the balance of benefits and harms cannot be determined for this age group.

Retinal Birefringence Scanning/Retinal Polarization

There is currently insufficient quality evidence to support the use of retinal birefringence scanning; existing evidence provides mixed results, is derived from high-risk populations, and is based on small sample sizes at single centers.

Bosque et al. (2021) reported the results of a prospective test-validation study evaluating the accuracy of the blinq™ Pediatric Vision Scanner for the detection of amblyopia and strabismus. Testing was performed by individuals masked to the diagnosis. Following testing, pediatric ophthalmologists performed complete examinations and were masked to the screening result. The study included 193 participants (53 previously treated, 140 treatment-naive participants); the authors specified that these participants included "65 (46%) with amblyopia or strabismus, 11 (8%) with risk factors/suspected binocular vision deficit without amblyopia/strabismus, and 64 (46%) controls." The authors also noted the following: "The sensitivity was 100%, with all 66 patients with referral-warranted ocular disease referred. Five patients with intermittent strabismus receiving pass results were deemed 'acceptable pass' when considering patient risk factors and amblyogenic potential. Specificity was 91%, with 7 incorrect referrals. Subanalysis of children aged 2-8 years (n = 92) provided similar results (sensitivity 100%; specificity 89%)." The authors concluded that very high sensitivity and specificity for detecting referral-warranted unilateral amblyopia and strabismus were detected with the blinq scanner. The authors further stated that "implementation of the device in vision screening programs could lead to improved rates of disease detection and

reduction in false referrals." The study is limited by the use of nonstandard calculations of adjusted sensitivity and specificity.

A cross-sectional study by Arnold (2020) evaluated the blinq binocular birefringent ocular alignment screener and the 2WIN with corneal reflex (CR) function (Adaptica, Padova, Italy), according to the AAPOS uniform guidelines. In this study, 100 adults and children were enrolled from a high-risk ophthalmology practice. Each participant was screened with the blinq screener, with validation by the AAPOS 2003 guidelines for ARFs (which had a prescreening probability of 66%). Then, the blinq was compared with the Adaptica 2WIN with CR, with validation by the AAPOS 2003 guidelines and additional screenings to identify participants with diminished binocularity. In comparison to the AAPOS 2003 guidelines, blinq had a sensitivity of 75%, specificity of 68%, and PPV of 81% compared with 2WIN with CR, which had a sensitivity of 91%, specificity of 68%, and PPV of 84%. With the addition of cases with presumed limited binocularity, blinq had a sensitivity of 64%, specificity of 71%, and PPV of 85%, while 2WIN with CR function had a sensitivity of 87%, specificity of 82%, and PPV of 93%. The authors concluded that the blinq Pediatric Vision Scanner performed well in identifying refractive amblyopia and strabismus risk factors compared with the AAPOS 2003 guidelines. Strengths of the study include the use of AAPOS uniform guidelines and the ability of older participants to confirm binocular status. Weaknesses include that (1) the study did not include an average community pediatric population; (2) it was a single center; and (3) there was a relatively small number of participants. Additionally, the sensitivity of the device was inferior to that of Adaptica 2WIN with CR.

In a comparative study, Jost et al. (2014) evaluated the diagnostic accuracy of the PVS in identifying strabismus and amblyopia and compared PVS with the Suresight Autorefractor, a widely used, automated pediatric screening device. Overall, 300 consecutive preschool children (aged 2-6 years) were screened. A masked comprehensive pediatric ophthalmic examination provided the gold standard for determining the sensitivity and specificity for each screening device. The primary outcome was the sensitivity and specificity of the PVS device for detecting strabismus and amblyopia. The secondary outcomes included the positive and negative likelihood ratios of the PVS for identifying the targeted conditions. In addition, sensitivity, specificity, and positive and negative likelihood ratios of the Suresight Autorefractor for the targeted conditions were assessed in the same cohort of children. The sensitivity and specificity of the PVS to detect strabismus and amblyopia were significantly higher than those of the Suresight Autorefractor. This study was performed in a clinical setting with a cohort of children referred for suspected visual impairments, resulting in higher incidences than what would be seen in the general population.

Loudon et al. (2011) performed a prospective study to investigate whether the PVS could detect anisometropic amblyopia as well as strabismus. The authors also followed up participants during treatment to determine whether the improvements gained from treatment would be reflected in improved vision test results. A total of 154 participants and 48 controls between the ages of 2 and 18 years participated in the study, with 21 children followed up longitudinally to detect changes in their binocularity scores. The control group consisted of participants with no strabismus, amblyopia, or anisometropia. The authors concluded that PVS identified children with amblyopia or strabismus with high sensitivity and specificity, while successful treatment restored normal binocularity scores in participants with amblyopia without strabismus. Study limitations again include a small size, single center, and engagement of participants with known risk factors; it was also noted in this study that there was a lack of racial diversity, with 74% of the participants being identified as Caucasian.

Nassif et al. (2006) evaluated the clinical performance of the PVS in children in a pediatric ophthalmology office setting. Overall, 77 children between 2 and 18 years of age received gold standard orthoptic examinations and were classified as at risk for amblyopia if strabismus or anisometropia was present. Binocularity, as determined by the PVS, was greater than 65% in all controls and less than 20% in all participants with constant strabismus. Binocularity ranged from 0% to 52% in participants with variable strabismus. All participants with anisometropia and no strabismus had binocularity scores of less than 10%. The PVS identified strabismus, when present, in all participants and identified three participants with anisometropia. The PVS shows potential to address a lack of screening instrumentation that is appropriate for use in preschool-aged children.

Clinical Practice Guidelines

American Association for Pediatric Ophthalmology and Strabismus (AAPOS)

The *AAPOS Uniform Guidelines for Instrument-Based Pediatric Vision Screen Validation 2021* (Arnold et al.), regarding instruments such as blinq, only state that "a novel instrument-based device using bilateral birefringent foveal scanning recently became commercially available and shows promise for screening for amblyopia per se."

U.S. Food and Drug Administration (FDA)

This section is to be used for informational purposes only. FDA approval alone is not a basis for coverage.

Ocular screening is a procedure and therefore not regulated by the FDA.

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Policy History/Revision Information

Date	Summary of Changes
06/01/2026	**Supporting Information** • Updated *Clinical Evidence* and *References* sections to reflect the most current information • Archived previous policy version 2026T0660E

Instructions for Use

This Medical Policy provides assistance in interpreting UnitedHealthcare standard benefit plans. When deciding coverage, the member specific benefit plan document must be referenced as the terms of the member specific benefit plan may differ from the standard plan. In the event of a conflict, the member specific benefit plan document governs. Before using this policy, check the member specific benefit plan document and any applicable federal or state mandates. UnitedHealthcare reserves the right to modify its policies and guidelines as necessary. This Medical Policy is provided for informational purposes. It does not constitute medical advice.

This Medical Policy may also be applied to Medicare Advantage plans in certain instances. In the absence of a Medicare National Coverage Determination (NCD), Local Coverage Determination (LCD), or other Medicare coverage guidance, CMS allows a Medicare Advantage Organization (MAO) to create its own coverage determinations, using objective evidence-based rationale relying on authoritative evidence (Medicare IOM Pub. No. 100-16, Ch. 4, §90.5).

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